

Math 2415
Paper Homework #2

1. [12.4, Cross Products]

Let $\mathbf{a} = \mathbf{i} + 2\mathbf{j} - 3\mathbf{k}$, $\mathbf{b} = \mathbf{i} - 5\mathbf{j}$ and $\mathbf{c} = \mathbf{j} + 2\mathbf{k}$.

- (a) Find the length of \mathbf{a} .
- (b) Find a unit vector that is orthogonal to both \mathbf{a} and \mathbf{c} .
- (c) Calculate the area of the parallelogram determined by the vectors \mathbf{a} and \mathbf{c} .
- (d) Calculate the volume of the parallelepiped determined by the vectors \mathbf{a} , \mathbf{b} , and \mathbf{c} .

2. [12.4, Cross Products] Consider the triangle with vertices $(10, 7, 13)$, $(1, 2, 3)$, $(4, 1, 2)$.

- (a) Find a point \mathbf{p} and two vectors \mathbf{u} and \mathbf{v} so that that the triangle has \mathbf{p} as a vertex and the vectors \mathbf{u} and \mathbf{v} as edges.
- (b) Use your answer to 2a to find the area of the triangle.

3. [12.5A, Lines]

- (a) Find a vector parametrization for the line, \mathcal{L} , passing through the points $P = (1, 2, 3)$ and $Q = (5, -6, 17)$.
- (b) Which of the points are on the line \mathcal{L} ? Which are on the line and are between P and Q ? Why?
 - i. $(4, 5, 2)$,
 - ii. $(3, -2, 10)$,
 - iii. $(-1, 6, -4)$.
- (c) Determine whether the line, \mathcal{L} ,
 - i. intersects the xy -plane,
 - ii. intersects with the z -axis.